

CLAIMS

What is claimed is:

1. A data-flow and context-flow data processing system comprising a plurality of data driven cores capable of switching between a plurality of contexts, wherein the plurality of data driven cores comprises a plurality of distributed multi-context storage units each capable of storing a plurality of context parameters corresponding to the plurality of contexts, each multi-context storage unit comprising:

a) a context register bank comprising

a plurality of context parameter registers for storing the plurality of context parameters, each context parameter register storing a parameter for one of the contexts, the plurality of context parameter registers having a corresponding plurality of inputs connected to an input connection, and a corresponding plurality of outputs; and

a multiplexer having a plurality of multiplexer inputs each connected to a corresponding one of the plurality of context parameter register outputs, for selecting a current context parameter set for transmission to a multiplexer output;

b) a context identification register connected to the context register bank, for storing a current context identification token identifying a current context for the context register bank, wherein the context identification register is connected to a select line of the multiplexer, for controlling the multiplexer to select the

31 current context parameter set for transmission;
32 and
33 the context identification register is connected to
34 a load enable line of each of the context
35 parameter registers, for enabling an updating
36 of a current context parameter set in a
37 corresponding context parameter register; and
38 c) logic connected to the multiplexer output for
39 receiving the current context parameter set and
40 processing a set of data tokens according to the
41 current context parameter set, connected to the
42 input connection of the context parameter registers
43 for providing updated context parameter sets to the
44 context parameter registers, and connected to the
45 context identification register for propagating the
46 current context identification token through the
47 multi-context storage unit.
48

1 2. The system of claim 1, further comprising logic for
2 controlling a flow of the set of data tokens through
3 the cores such that each data token is transferred from
4 a first core to a second core upon a synchronous
5 assertion of a request signal from the second core to
6 the first core, and of a ready signal from the first
7 core to the second core.
8

1 3. The system of claim 1, wherein an interface of a core
2 includes a content specification flag for indicating
3 whether a token containing the flag is a data token or
4 a context identification token.
5

1 4. The system of claim 1, wherein an interface of a core
2 includes a dedicated context identification field for

transferring a current context identification token with each data token passing through the interface.

- 5.
- A data-flow and context-flow data processing system, comprising a plurality of data-driven cores including:
- a) logic for controlling a flow of data tokens and context identification tokens through the cores;
 - b) a plurality of distributed multi-context storage units, each multi-context storage unit including:
 - a context identification register for storing a context identification token identifying a current context of said each multi-context storage unit; and
 - a multi-context register bank for storing a plurality of context parameters corresponding to a plurality of contexts,wherein the context identification register is connected to the multi-context register bank for setting the multi-context register bank to the current context; and
 - c) logic for processing the data tokens according to a context parameter corresponding to the current context.

- 6.
- A data-flow and context-flow data processing system, comprising a plurality of data-driven cores, each of the cores including:
- a) a context identification storage unit for storing a current context identification token; and
 - b) logic for controlling a flow of the current context identification token through the cores such that the current context identification token is transferred from a first core to a second core upon a synchronous assertion of a request signal from the

second core to the first core, and of a ready signal from the first core to the second core.

7. A data- and context-flow processing method comprising the steps of:

- a) propagating a current context identification token through a plurality of data flow cores integrated on a chip, the current context identification token identifying a current context;
- b) retrieving a set of context parameters corresponding to the current context from each of a plurality of multi-context storage units distributed through the cores, as the current context identification token propagates through the multi-context storage units; and
- c) processing a set of data tokens in the current context, according to the set of context parameters.

8. A data- and context-flow data processing system comprising a first data- and context-flow core and a second data- and context-flow core integrated on a chip, the first core comprising:

- a) an input interface for receiving a data token and a context identification token from the second core, the context identification token identifying one of a plurality of contexts as a current context, wherein each token transfer between the second core and the first core occurs upon a synchronous assertion of a request signal from the first core to the second core and a ready signal from the second core to the first core;
- b) a context identification register connected to the input interface, for storing the context identification token;

- 17 c) a multi-context storage unit connected to the
18 context identification register, for storing a
19 plurality of context parameters corresponding to the
20 plurality of contexts;
21 d) control and processing logic connected to the
22 context identification register and the context
23 register bank, for

24 \ 9. A data- and context-flow data processing system
1 comprising a plurality of cores, each of the cores
2 comprising:
3

- 4 a) an input control bus for transferring input control
5 signals;
6 b) an input token bus for receiving input tokens in
7 response to assertions of the input control signals,
8 the input tokens including
9 an input data token to be processed by the core, and
10 an input context identification token for specifying
11 a current context;
12 c) an output control bus for transferring output
13 control signals; and
14 d) an output token bus for sending output tokens in
15 response to assertions of the output control
16 signals, the output tokens including
17 an output data token derived from the input data
18 token, and
19 an output context identification token equal to the
20 input context identification token, for
21 specifying the current context.
22

1 \ 10. A multithreaded data processing system comprising a first
2 data-driven core, a second data-driven core, and a third
3 data-driven core integrated on a chip, the first core
4 comprising:

- 5 a) a first input interface connected to the second
6 core, comprising
7 a first input request connection for asserting a
8 first input request signal to the second core,
9 a first input ready connection for receiving a first
10 input ready signal asserted by the second core,
11 and
12 a first input data connection for receiving from the
13 second core an input context token for
14 establishing a context state for the first
15 core;
- 16 b) processing logic connected to the first input
17 interface, for processing a data token according to
18 the context state;
- 19 c) a first output interface connected to the third
20 core, comprising
21 a first output request connection for receiving a
22 first output request signal asserted by the
23 third core,
24 a first output ready connection for asserting a
25 first output ready signal to the third core,
26 and
27 a first output data connection connected to the
28 processing logic, for transmitting to the third
29 core a first output context token derived from
30 the first input token, for establishing the
31 context state for the third core;
- 32 d) first input control logic connected to the first
33 input interface, for controlling the first core to
34 receive the first input context token if the first
35 input request signal and the first input ready
36 signal are asserted with a predetermined synchronous
37 relationship; and

- 38 e) first output control logic connected to the first
39 output interface, for controlling the first core to
40 transmit the first output context token to the third
41 core if the first output request signal and the
42 first output ready signal are asserted with a
43 predetermined synchronous relationship.
44

1 11. The system of claim 10 wherein:

- 2 a) the first input control logic comprises logic for
3 controlling the first core to receive the first
4 input context token if the first input request
5 signal and the first input ready signal are
6 asserted synchronously; and
7 b) the first output control logic comprises logic for
8 controlling the first core to transmit the first
9 output context token to the third core if the
10 first output request signal and the first output
11 ready signal are asserted synchronously.

1 12. The system of claim 11 wherein:

- 2 a) the first input control logic comprises logic
3 for controlling the first core to receive the
4 first input context token synchronously with
5 the first input request signal and the input
6 ready signal; and
7 b) the first output control logic comprises logic
8 for controlling the first core to transmit the
9 first output context token synchronously with
10 the first output request signal and the output
11 ready signal.
12

1 13. The system of claim 10 wherein:

- 2 a) the first core further comprises a second output
3 interface connected to a fourth core integrated on
4 the chip, the second output interface comprising
5 a second output request connection for receiving a
6 second output request signal asserted by the
7 fourth core,
8 a second output ready connection for asserting a
9 second output ready signal to the fourth
10 core, and
11 a second output data connection connected to the
12 data processing logic, for transmitting the
13 output context token to the fourth core; and
14 b) the first core further comprises second output
15 control logic connected to the second output
16 interface, for controlling the first core to
17 transmit the output context token to the fourth
18 core if the second output request signal and the
19 second output ready signal are asserted
20 synchronously.

21
22 14. The system of claim 10, wherein the first core further
23 comprises a multi-context storage unit connected to the
24 processing logic, for storing a plurality of context
25 parameters corresponding to a plurality of contexts.

26
27 15. The system of claim 14 wherein the multi-context
28 storage unit comprises:

- 29 a) a plurality of registers connected in parallel,
30 for storing a plurality of context parameter
31 values for a corresponding plurality of
32 contexts; and
33 b) a multiplexer connected to the outputs of the
34 plurality of registers, for selecting for
35 transmission a value of the context parameter

10 corresponding to a current context state for
11 the multi-context storage unit.

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1 \16. A multithreaded data processing system comprising a first
2 data-driven core and a second data-driven core, the first
3 core comprising an input interface connected to the
4 second core, the input interface including:
5 a) an input request connection for asserting an input
6 request signal to the second core;
7 b) an input ready connection for receiving an input
8 ready signal asserted by the second core; and
9 c) an input data connection for receiving from the
10 second core, upon a synchronous assertion of the
11 input request signal and the input ready signal, a
12 first input context identification token identifying
13 a current context state.

14
15 \17. A multithreaded data processing system comprising a first
16 data-driven core, a second data-driven core, and a third
17 data-driven core integrated on a chip, the first core
comprising:
a) an input interface connected to the second core,
comprising
a control bus for transmitting a set of first
control signals between the first core and the
second core, and
an input data bus for receiving from the second
core, upon the assertion of the set of first
control signals according to a predetermined
protocol
an input data token, and
an input context identification token for
establishing a current context state in
the first core;

- 18 b) processing logic connected to the first input
19 interface, for generating an output data token from
20 the input data token according to the context state;
21 and
22 c) an output interface connected to the third core,
23 comprising
24 an output control bus for transmitting a set of
25 second control signals between the first core
26 and the third core, and
27 an output data bus connected to the processing
28 logic, for transmitting to the third core, upon
29 the assertion of the set of first control
30 signals according to the predetermined protocol
31 the first output token, and
32 a first output context token derived from the
33 first input token, for establishing the
34 current context state in the third core.
35

18. A data- and context-flow data processing method comprising
the steps of:

- a) establishing a first data- and context-driven core
and a second data- and context-driven core, the
second core being connected to the first core for
receiving data tokens and context tokens from the
first core; and
b) operating the first core in a first context, and
concurrently, operating the second core in a second
context different from the first context.

19. A data- and context-flow processing method comprising the
steps of:

- a) establishing a data- and context-driven core
comprising a plurality of interconnected pipestages,
the pipestages including

6 logic for controlling a flow of data tokens and
7 context identification tokens therethrough, and
8 a plurality of distributed multi-context storage
9 units each storing a plurality of context
10 parameters and each responsive to the context
11 identification tokens; and

- 12 b) operating a first set of pipestages in a first
13 context specified by a first context identification
14 token present within the first set of pipestages, and
15 concurrently, operating a second set of pipestages in
16 a second context specified by a second context
17 identification token present within the second set of
18 pipestages.
19